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FOREST INSECT INVESTIGATIONS

SUMMARY REPORT

ON THE EUROPEAN SPRUCE SAWFLY

IN 1933

by

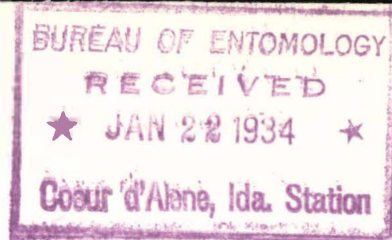
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SUMMARY REPORT ON THE EUROPEAN SPRUCE SAWFLY IN 1933.

R. E. Balch
Dominion Entomological Laboratory, Fredericton, N. B.

INTRODUCTION.

The European, or White Spruce, sawfly (*Diprion polytomum* (Hartig)) has been causing serious damage to the spruce forests of the Gaspé peninsula for several years. The Division of Forest Insects has studied the outbreak since 1931 from a camp on the headwaters of the Cascapédia River. Mr. L. J. Simpson has been in charge of the camp and general survey, and Mr. M. L. Prebble has had charge of the biological investigations. The following report is a summary of the situation in the fall of 1933.

We have been assisted in this work by the co-operation of the Quebec Forest Service and the Pulp and Paper companies operating in the area, who have sent in reports of surveys, including plot data and cocoon samples. The International Paper Company of New Brunswick has been particularly active in making such surveys and a great deal of valuable information has been received through the reports of Mr. L. S. Webb and his staff. We are also indebted to the Hammermill Paper Company, through Mr. B. E. Claridge, for much assistance, including the collection of samples and the taking of meteorological records.

A leaflet describing the insect for identification purposes will shortly be available. The larva is like a caterpillar with a smooth green body and brownish head. The fifth stage, which is the one most commonly seen, has five fine white lines along the body. It feeds on the needles, preferring as a general rule the older foliage. When mature, it drops to the ground and spins a golden brown cocoon $3/8$ " long. This gradually becomes darker. It overwinters in this stage, pupates and emerges in the early summer as a stout, black, four-winged fly with yellowish markings.

Associated with the sawfly has been an outbreak of the Eastern spruce barkbeetle (*Dendroctonus piceaperda* Hopk.) which has already killed a great many trees.

PAST HISTORY:

The sawfly, which has been known in Europe for a long time, but not as a serious pest, was first discovered in America in 1930 when it was found to have partially defoliated white and black spruce over a considerable area of the Gaspé peninsula. In 1931 it increased in numbers and an aeroplane survey indicated that at least 2,000 square miles were noticeably infested. In 1932 the season was late and, in general, cold and wet. Less than 30 per cent of the dormant larvae pupated and produced flies, the rest remaining dormant. The attack was less severe and the trees continued to put on fair shoot growth which approximately offset the loss of foliage from sawfly feeding.

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The situation last fall was therefore somewhat less threatening; but, as was pointed out in the previous report, there were still plenty of larvae in the ground to cause a greatly increased attack provided climatic or other conditions should cause a larger percentage of emergence than in the past two years. Also, the average increment of the spruce had been seriously reduced and the trees were in a weakened condition. At the same time the barkbeetle had already killed a great many trees.

THE 1933 ATTACK.

The weather during the past season was warm and unusually dry. July, the period of greatest adult emergence and oviposition, was particularly fine and warm. Apparently as a result of this, the percentage emergence was rather more than twice as great as in the past two years. Adults and larvae were more numerous than they have ever been and by the end of September the droppings of the feeding larvae sounded like rain in the forest. The attack increased from two to fourfold over the whole infested area.

In spite of the fact that some of the larvae were again caught on the trees by early winter weather (there were 4 inches of snow at our camp on October 20th), our population data indicate that in the heart of the infested area there were at least twice as many overwintering larvae in the fall as in the spring, and in other parts the increase has been greater.

The defoliation was greatest on white spruce, which lost practically all its old foliage over much of the heavily infested area. Some of the new foliage was also consumed and here and there trees were completely stripped of needles. Black spruce slopes suffered almost as heavily in places but a considerable tuft generally remains uninjured in the tip of the crown of black spruce. When growing pure on flats, it has been still less severely attacked.


AREA INFESTED.

The infested area has not been noticeably increased to any great extent, but the part of it suffering heavy attack has become much larger. Some 4,000 square miles may be classed as heavily attacked, including the central part of the peninsula and extending in places down to the shore on the north side but not going as close to the sea on the south and east. This attack reaches to the Matapedia valley and west of that in more or less isolated areas. This is shown roughly on the attached map.

It will be seen that the most westerly infestation of importance occurs in the Parke Forest Reserve on the boundary between Temiscouata and Kamouraska counties. At least 2 or 3 square miles are involved at this point. Although no outbreaks have been reported between here and Metis Lakes they may, and probably do, occur.


The sawfly has been found in small numbers in different parts of New Brunswick and may be present throughout the province. Near Fredericton, it can be collected in most of the spruce stands but is quite scarce. Nor does it show any signs of increasing as yet south of the Quebec border. In southern New Brunswick, it has been found to be capable of two generations a year and in the second generation eats the new foliage

SPRUCE SAWFLY INFESTATION
Gaspé, 1933.

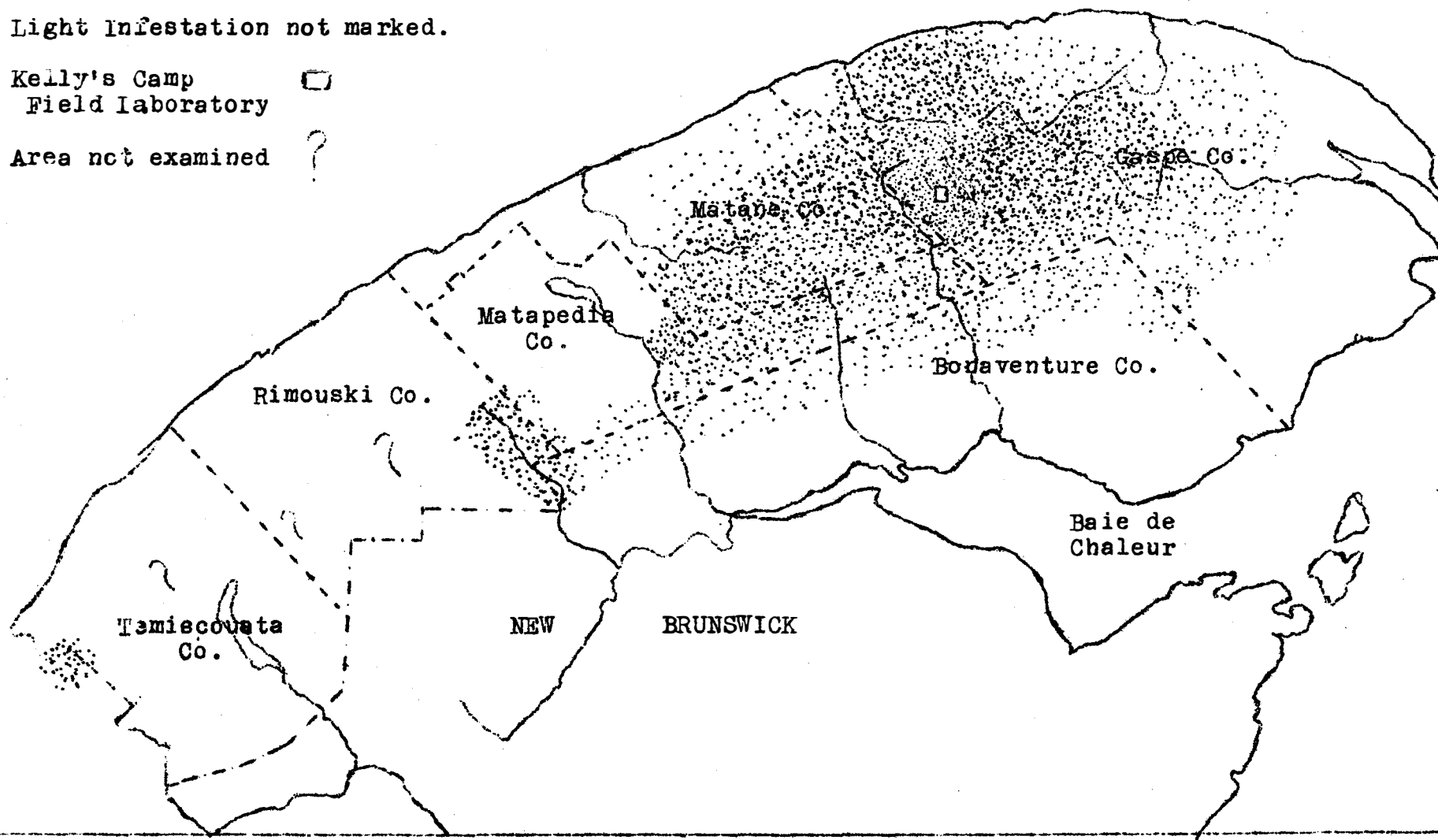
Heavy Infestation 

Medium Infestation 

Light Infestation not marked.

Kelly's Camp 
Field Laboratory

Area not examined ?



as readily as the old. This would seem to be a more favourable environment than the Gaspé.

DAMAGE.

The mortality which has resulted so far consists mainly of trees attacked by the Eastern spruce barkbeetle. This beetle has been killing spruce throughout the Gaspé for three years. In 1931, roughly, 6 per cent of the spruce had been killed in the Cascapédia area. In 1932, about 16 per cent of the white spruce and 9 per cent of the black had been killed in the merchantable stands. By volume, the percentages were 28 per cent and 14 per cent, since the larger trees were taken by preference.

The attack continued in 1933 and the total loss was increased to: White spruce 24% by stems, 41% by volume; black spruce 16% by stems, 24% by volume. This damage has been confined to the bottoms of the valleys or to the gentler slopes, where the white spruce grows best, and to trees of 6 inches D.B.H. and over. In other words, the loss is among the largest trees and on the most accessible sites.

These figures are based on a cruise of certain valleys on the headwaters of the Cascapédia and St. Anne rivers. They are believed to be fairly representative of conditions over a good deal of the interior of the Gaspé, although the damage is probably less taking the Gaspé as a whole. Fifty-one lines were run across the valleys as far up the slopes as white spruce of any size and quantity grows. They are considered to include all the fully merchantable area containing white spruce. All trees of 5 inches D.B.H. and over were tallied. Only 21.22 acres were measured in 1933, but the figures were sufficiently uniform to indicate significance for the drainages cruised and they compare very closely with last year's results.

% COMPOSITION OF MERCHANTABLE FIR-SPRUCE TYPE.

	<u>White Spruce</u>	<u>Black Spruce</u>	<u>Balsam</u>	<u>Birch & Poplar</u>
% by stems.	26.4	11.2	58.2	4.2
% by volume.	39.9	10.8	45.0	4.3

% OF SPRUCE KILLED BY BARKBEETLE.

	<u>White Spruce.</u>		<u>Black Spruce.</u>	
	<u>By stems</u>	<u>By volume</u>	<u>By stems</u>	<u>By volume</u>
Before 1933	17.90	31.55	7.16	10.00
In 1933	5.96	9.25	8.38	14.00
Total:	23.86	40.80	15.54	24.00

Our cruise in 1932 gave the percentages of beetle-killed trees as: White spruce, by trees 16.3%, by volume 27.8%; black spruce, by trees 8.9%, by volume 14.3%. These figures compare very closely with this year's cruise although it was not run over the same lines.

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The trees actually dead from sawfly attack, unaided by barkbeetles, are as yet almost negligible, constituting probably less than 2 per cent of the stand. Mortality from this year's attack will not be evident until the end of next season, or even later.

The average volume per acre of spruce and fir ran as high as 35.0 cords, of which 18.6 cords were spruce. In these drainages the stand per acre for this type is very high, being well above the average for the whole peninsula. The figures include, of course, all the insect-killed trees and no allowance is made for defect. They show that the total loss is large. The seriousness of the situation lies, however, in the fact that although the barkbeetle outbreak has passed its peak, further loss may be expected next year from the beetle as well as from the 1933 sawfly attack, and that the whole peninsula is more heavily infested with the sawfly than ever. Mr. L. S. Webb estimates that there are some twenty million cords of spruce in the Gaspé.

THE FUTURE.

There are, on the average, something like 20 sawfly larvae per square foot beneath the spruce trees on the area mapped as "heavy". This number will be reduced somewhat during the winter by shrews, but there will be a distinctly larger potential fly emergence next spring than in any previous year. If the weather is favourable there will be another attack at least as heavy as in 1933. Should the emergence be low, as in 1932, there will still be serious injury and a reserve of larvae in the ground to produce probably a greater emergence in 1935. In the complete absence of attack by native parasites, only an unusual combination of climatic factors, aided by shrew abundance, would seem likely to bring the outbreak under control until the larvae are starved from lack of food.

Considering the weakened condition of the trees and the low reserve of foliage, the danger of widespread destruction among the remaining spruce is great.

The outbreak does not seem to have spread to a noticeable extent into uninfested areas although it has spread from heavily infested to lightly infested areas. The presence of large numbers of the adults on the barren tops of such mountains as Mt. Albert has shown, however, that the insect is capable of being carried considerable distances by air currents, or wind.

Being apparently of European origin, the sawfly must be considered as the most serious insect menace to spruce that has yet appeared. It needs careful study in places such as central New Brunswick where it would appear to exist in an endemic status. If it is held in control there we need to know the factors which produce control. If not, we need to follow the development into an epidemic.

CONTROL.

The larvae can be easily controlled by dusting where such an operation is possible, but the only hope of satisfactory permanent control lies in the assistance of natural factors. The study and importation of European parasites has been commenced through the co-operation of the Parasite Laboratory of the Imperial Institute of Entomology.

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Some shipments were received by the Dominion Parasite Laboratory during the past year and a number of parasites which have proved of importance in Europe have been liberated in the Gaspé. A good deal of work, however, is necessary to discover which of the species are likely to adapt themselves to Canadian conditions, and, if efficient species are found, to collect, rear, and liberate them in sufficient numbers.

In the stands now heavily infested, where economic conditions permit of an operation, plans should be made for early salvage.